# Understanding Lake Erie and Its History and Susceptibility to HABs

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## One of the Most Important Lakes in the World

- Dead lake image of 60s and 70s.
- Poster child for pollution problems in this country.
- But, most heavily utilized of any of the Great Lakes.
- Shared by 4 states and 2 countries.
- Best example of ecosystem recovery in world.

# Great Lakes Land Use

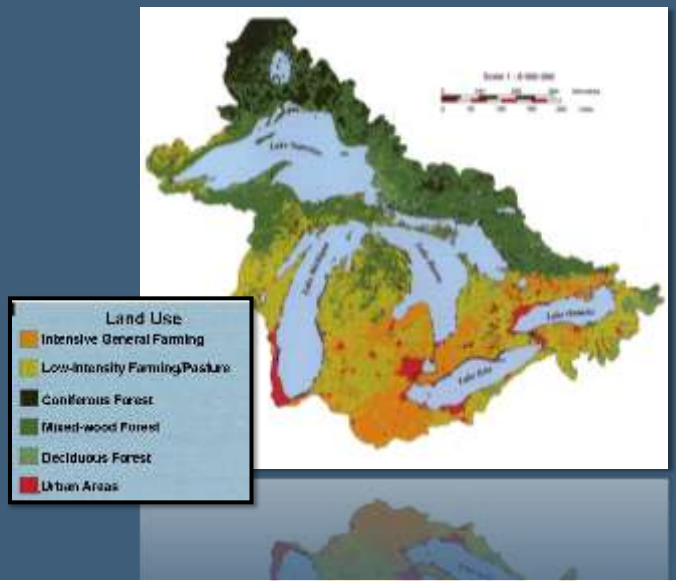
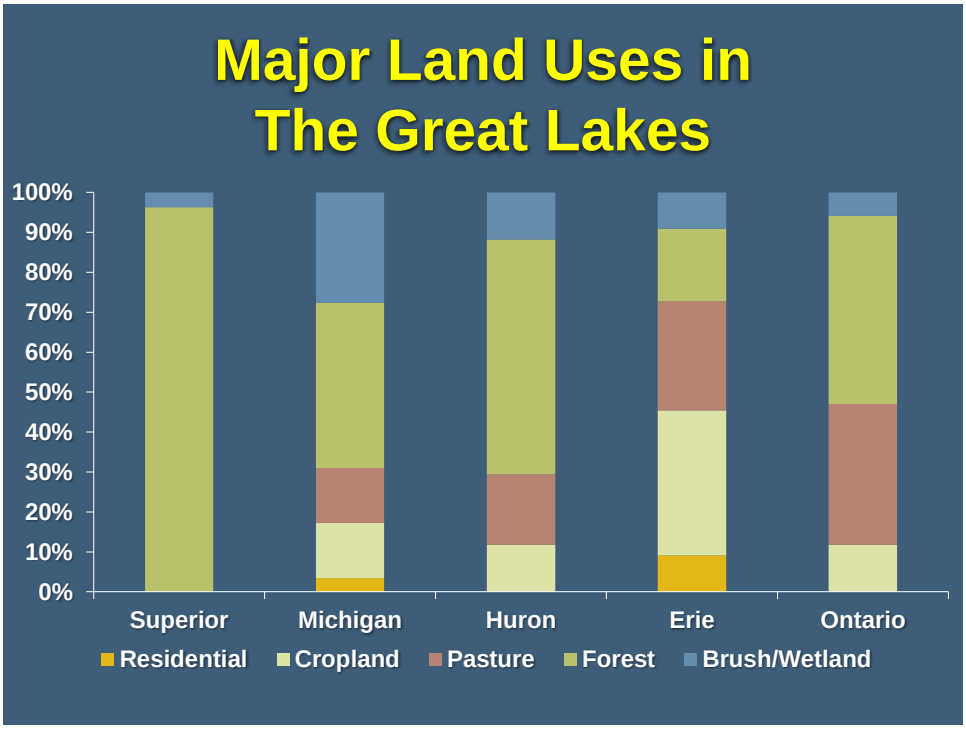



Image: Ohio Sea Grant

# Depths of the Great Lakes


Photo: Ohio Sea Grant


Buffalo
Eastern Basin
Detroit
Lake Erie
Western Basin
Central Basin
Toledo
Cleveland
Side View
Surface water warmed by the sun.
Epilimnion
Thermocline
Cold oxygen-poor water
Hypolimnion
Photo: Ohio Sea Grant


Major Land Uses in The Great Lakes
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Superior
Michigan
Huron
Erie
Ontario
Residential
Cropland
Pasture
Forest
Brush/Wetland

# Because of Land Use, Lake Erie Gets:

- More sediment
- More nutrients (fertilizers and sewage)
- More pesticides
- (The above 3 items are exacerbated by storms, which will be more frequent and severe due to climate change.)
- And Lake Erie is still biologically the most productive of the Great Lakes—And always will be!!

# 50:2 Rule

(Not exact, but instructive)

Lake Superior:

20% of the water and 50% of the fish

## 80:10:10 Rule

- 80% of water from upper lakes
- 10% from Lake Erie tributaries
- 10% direct precipitation

## Lake Erie Stats

- Drinking water for 11 million people
- Over 20 power plants
- Power production is greatest water use
- 300 marinas in Ohio alone
- Walleye Capital of the World
- 40% of all Great Lakes charter boats
- Ohio's charter boat industry is one of the largest in North America
- $1.5 billion sport fishery
- One of top 10 sport fishing locations in the world
- The most valuable freshwater commercial fishery in the world
- Coastal county tourism value is over $11.5 billion

# Historical Trends: The Lake Erie Ecosystem

- 1969—Cuyahoga River burns
- Getting worse annually to 1970
- Stable 1970-75
- Improving 1975-1995
- 1995+ Getting worse

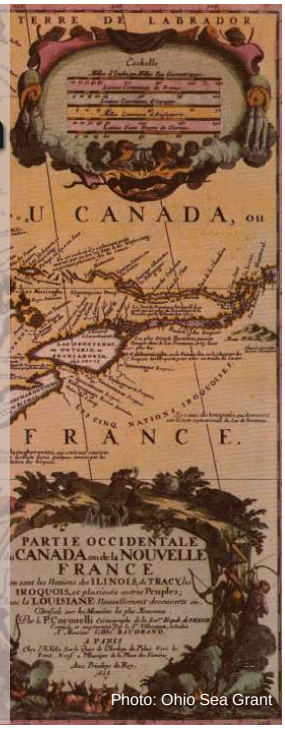
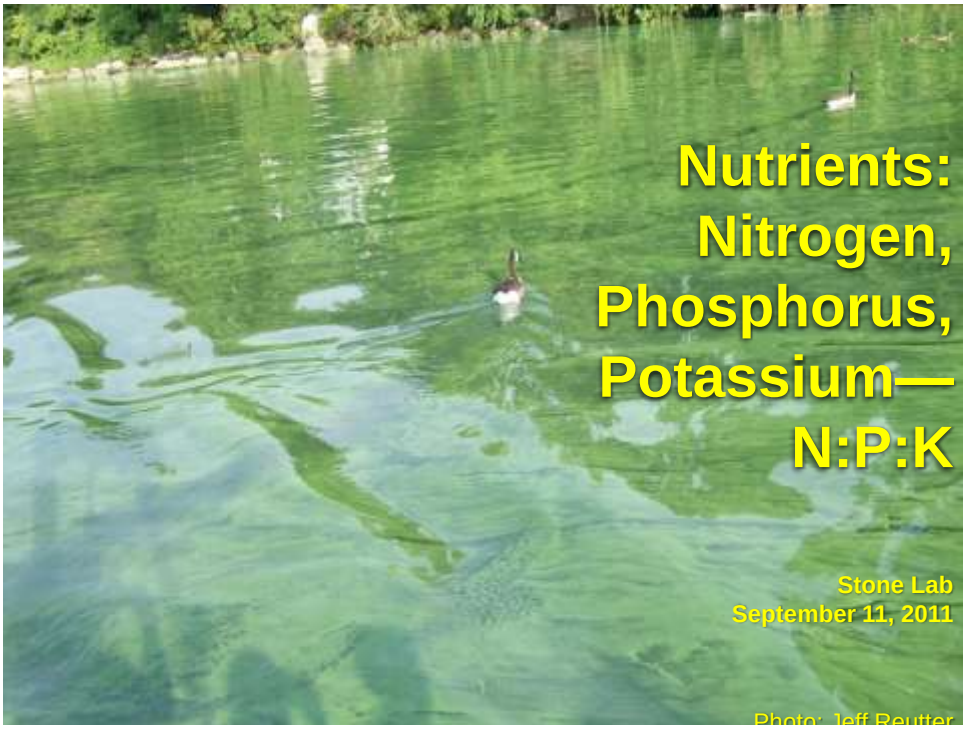



Photo: Ohio Sea Grant

# Lake Erie's Biggest Problems/Issues

- Sedimentation
- Phosphorus and nutrient loading
- Harmful algal blooms
- Aquatic invasive species
- Dead Zone
- Climate Change—Makes the others worse
- Coastal Economic Development


Sedimentation
Photo: NOAA Satellite Image


Nutrients: Nitrogen, Phosphorus, Potassium— N:P:K
Stone Lab
September 11, 2011
Photo: Jeff Reutter

## Nutrients: Problem or Benefit?

- On our lawns, they make our grass grow
- In water, they make algae and plants grow
- Lake Erie is most productive Great Lake because: shallowest, warmest, and most nutrients.
- But it is possible to have too much of a good thing.
- Too much algae, wrong kinds of algae

## Why does Lake Erie get most nutrients?

- The most agriculture in its basin
- Few forests
- Wetlands gone
- Large human population—water treatment, septic tanks, sewage treatment (or lack thereof)

## What brought about the rebirth?

- **Phosphorus reductions** from point sources (29,000 metric tons to 11,000); **and agriculture helped!**

## Why are we targeting phosphorus?

- Normally limiting nutrient in freshwater systems
- P reduction is best strategy ecologically and economically
- Reducing both P and N would help

# Are we sure phosphorus reductions will solve the problem?

- It worked in the 70s and 80s and turned Lake Erie into the "Walleye Capital of the World"
- Approximately a 2/3 reduction in total P loading (29,000 tons to 11,000)

# Blue-green Algae Bloom circa 1971, Lake Erie

Photo: Forsythe and Reutter

# Microcystis, Stone Lab, 8/10/10

Photos: Jeff Reutter

# 5 July HAB Press Conf

- Goal: to forecast the severity of the 2012 bloom
- At Stone Lab in partnership with NOAA, Heidelberg, U Toledo, and OSU Sea Grant
- Severity of HABs in Western Basin can be forecast based on nutrient loading 1 March to 30 June

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